passing the mixture through a membrane unit to separate suspended solids in the mixture from liquid.

4. The process of claim 1 wherein the steps of [extracting] removing the mixture from the reactor while exposing the mixture to alternating periods of aerobic and anoxic conditions and passing the mixture through a membrane unit to separate suspended solids in the mixture from liquid are completed in about 60 minutes.

Please add new claim 7 as follows:

7. (New) The process of claim 1 comprising the use of a sequencing batch reactor.

REMARKS

The Abstract was objected to as being too long. Accordingly, the Abstract has been edited to a fraction of its original length. Applicants submit that the edited Abstract resolves the objection. Furthermore, Applicants acknowledge, and agree with the Examiner's comment that "[t]he pending claims are not limited to SBR reactors." 8/24/01 Office Action, at p. 2. The amended Abstract reflects this.

Claims 1-4 are currently pending in the case. Claims 1 and 4 were objected to on the ground that the term "extracting" is a term of art in chemical engineering process industries and it was suggested that the term "removing" be used instead. Accordingly,

Applicants have amended claims 1 and 4 to substitute the term "removing" for the term "extracting."

Claims 1-4 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 5,304,308 to Tsumura, et al. ("Tsumura") in view of U.S. Patent No. 6,113,789 to Burke ("Burke"). Applicants respectfully disagree with this rejection and believe that all pending claims distinguish before the cited references.

Tsumura teaches a flow-through system for biologically treating sewage which requires the use of a first aeration tank, a second aeration tank and a settling tank attached in series. Operations in the first and second tanks are controlled using a combination of oxidation-reduction potential ("ORP") meters or ORP and dissolved oxygen ("DO") meters. Tsumura Abstract. See also Tsumura col. 2 lines 57-61 ("[T]he present inventors have conceived an apparatus consisting of a first aeration tank into which sewage flows, a second aeration tank that is connected in series to the first aeration tank, and a final settling tank....").

> According to the control method of the invention, first and second aeration tanks are employed in an intermittent aeration process, and operations of the tanks are controlled using a DO meter and an ORP meter.
>
> According to first and second control methods of the invention, an ORP meter is applied to the second aeration tank. In the first aeration tank, after aeration is performed for a predetermined period T_a, the aeration is stopped to start agitation. In the second aeration tank, the sum T_d of an aeration period T_b and an agitation period T_c is controlled to a predetermined period T_{ds}

> longer than T_a based on a time when a bending point appeared on an ORP curve detected by the ORP meter in a pervious cycle (first method) or on a time when an ORP value reached a predetermined value in a previous cycle (second method). Operations of the first and second aeration tanks are simultaneously transferred from the agitation to the aeration based on a detection of the ORP bending point (first method) or the ORP value equal to the predetermined value (second method).

Tsumura, col. 4 lines 32-46. See also Tsumura, col. 5 lines 25-45 (describing "third and fourth control methods" using a combination of ORP and DO meters) and Tsumura, col. 6 lines 37-56 describing "fifth and sixth control methods" using a combination of ORP meters). The total process requires 16-32 hours. Tsumura, col. 3 lines 7-9.

The use of separate aeration tanks and combinations of ORP or ORP/DO meters to control operations of the tanks is a "fundamental concept of the invention." Tsumura, col. 8 lines 27-28.

> [I]n the first tank, a nitrification and denitrification period is controlled to a fixed period to secure a sufficient phosphorous release. In the second tank, while nitrification and denitrification are performed, a one-cycle period of control is maintained at a predetermined period. In other words, while the one-cycle period is controlled in the second tank, in the first tank a sufficient phosphorous release period that is necessary for phosphorus removal is secured in the one-cycle period.

Tsumura, col. 8 lines 33-42. As the Examiner has noted, in all of the control methods, liquid-solids separation is performed by gravitational sedimentation. Tsumura, col. 3 lines 4-5.

The Applicants' invention, by contrast, does not require the use of gravitational sedimentation for liquid-solids separation.

This is accomplished through use of a membrane unit. Moreover, the Applicants' invention accomplishes phosphorous release, denitrification and aerobic, anaerobic and anoxic conditions in a single vessel. Furthermore, unlike the Tsumura process in which liquid-solids separation is performed by gravitational sedimentation only after treatment of the waste material in first and second aeration tanks, in the Applicants' process treatment of the mixture takes place during the liquid-solids separation process. And, unlike the Tsumura process in which the treatment periods are limited by ORP or DO meter readings, the process of Applicant's invention is limited only durationally. In other words, while in the Tsumura process the amount of material that can be processed in a given amount of time is strictly limited by ORP and DO values, this is not a limitation of Applicant's invention which allows the user to predetermine the amount of material to be processed in a particular time period. While ORP and DO meters may be used in connection with the Applicants' process, such meters do not control the process.

Claims 2-4 were also rejected under 35 U.S.C. § 103 based on Tsumura in view of Burke *and further in view of U.S. Patent No. 5,624,565 to Lefevre, et al. ("Lefevre")*. Claims 2-4 include all the limitations of claim 1. Like Tsumura, Lefevre teaches a control system in which measurements of ORP values govern the treatment periods. The process cannot proceed to a subsequent step (i.e.,

anaerobic conditions to aerobic or anoxic conditions) unless a predetermined ORP value is reached. Lefevre, col. 2 lines 31-47. Lefevre does not teach or suggest the Applicants' single-vessel process in which treatment of wastewater takes place during liquid-solids separation and the treatment periods may be regulated strictly as a function of time.

Finally, newly added claim 7, which depends from claim 1 and specifies the use of a sequencing batch reactor to accomplish the process steps, is patentable over the prior art cited by the Examiner for the above reasons, and the additional reason that Tsumura teaches the use of a multi-tank flow-through system. Tsumura does not teach the use of a sequencing batch reactor to accomplish the mixing, exposing and removing steps.

U.S. Patent No. 6,190,554 to Mandt ("Mandt") has been "cited of interest" by the Examiner. Applicants appreciate the Examiner bringing this patent to their attention and, as noted above, agree with the Examiner's observation that "[t]he pending claims are not limited to SBR reactors. Applicants note that their invention differs from the sequencing batch reactor systems taught in Mandt, which require multiple tanks and separate anoxic, aerobic, settling and decanting "zones." See, e.g., Mandt, FIGS. 1 and 2.

For the foregoing reasons, it is respectfully submitted that all of the pending claims are now in a condition for allowance.

PATENT
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Respectfully submitted,

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PROPOSED CLAIM CHANGES
SERIAL NO. 09/525,842

1. (Amended) A process for the treatment of waste water, comprising the steps of:

drawing waste water into a vessel containing an activated sludge;

mixing the waste water and the activated sludge in the vessel to create a mixture;

exposing the mixture in the vessel to anaerobic conditions for a sufficient time to permit the release of phosphorous and denitrification of oxidized nitrogen;

exposing the mixture in the vessel to alternating periods of aerobic and anoxic conditions for a sufficient time to permit the oxidation of organic contaminants in the waste water and nitrogenous waste products and the uptake of phosphorous followed by the denitrification of oxidized nitrogen;

[extracting] removing the mixture from the reactor while exposing the mixture to alternating periods of aerobic and anoxic conditions; and

passing the mixture through a membrane unit to separate suspended solids in the mixture from liquid.

2. The process of claim 1 wherein said steps of mixing the waste water and the activated sludge in the vessel to create a mixture and exposing the mixture in the vessel to anaerobic conditions for a sufficient time to permit the release of phosphorous and denitrification of oxidized nitrogen are completed in about 15 minutes.

3. The process of claim 1 wherein the step of exposing the mixture in the vessel to alternating periods of aerobic and anoxic conditions for a sufficient time to permit the oxidation of organic contaminants in the waste water and nitrogenous waste products and the uptake of phosphorous followed by the denitrification of oxidized nitrogen is completed in about 45 minutes.

4. The process of claim 1 wherein the steps of [extracting] <u>removing</u> the mixture from the reactor while exposing the mixture to alternating periods of aerobic and anoxic conditions and passing the mixture through a membrane unit to separate suspended solids in the mixture from liquid are completed in about 60 minutes.

7. (New) The process of claim 1 comprising the use of a sequencing batch reactor.